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7. A helium-free TEA CO<sub>2</sub> laser according to claim 1, wherein said pair of electrodes is selected from profiled, cylindrical, or unprofiled electrodes with rounded off edges.
  8. A helium-free TEA CO<sub>2</sub> laser according to claim 1 wherein said suitable means for preionising the said gas mixture in the inter-electrode volume comprises sparks produced between a plurality of pairs of preionising cylindrical metallic pins, positioned along the length of the said electrodes, one above the other with a uniform gap and located at an optimum distance on either or any one side of the said electrodes at regular intervals.
  9. A helium-free TEA CO<sub>2</sub> laser according to claim 1 wherein one of said pair of electrodes is semi transparent.
  10. A helium-free TEA CO<sub>2</sub> laser according to claim 9 wherein means for preionising the said gas mixture in the inter-electrode volume comprises sparks produced between the semi-transparent electrode and a plurality of uniformly spaced preionising cylindrical metallic pins, positioned beneath and along the length of the said semi-transparent electrode.
  - <sup>11</sup>11. A helium-free TEA CO<sub>2</sub> laser according to claim 1 wherein the said inter-electrode volume is selected from 1 cm<sup>3</sup> to 200 cm<sup>3</sup>.
  - <sup>12</sup>12. A helium-free TEA CO<sub>2</sub> laser according to claim 1 wherein the operating efficiency on TEM<sub>00</sub> mode is about 5.2% for the Ernst profiled system as described in embodiment 1.